BlackDiamond 12800R Series

BlackDiamond® 12800R series is purpose-built for metro providers to deliver new business and residential services.

Features

High Service Density to Increase Revenue per Subscriber

- Hierarchical Quality of Service (H-QoS) engine
- vMAN service multiplexing and cross connect
- CLEAR-Flow security engine

Carrier-Class Scalability to Scale and Manage Networks with Ease

- MAC-in-MAC for Ethernet scaling
- H-VPLS for MPLS scaling
- XML-based service provisioning
- Ethernet ping and traceroute

Carrier-Class Availability for Quality Subscriber Experience

- Redundant system design
- ExtremeXOS® modular operating system
- Ethernet Automatic Protection Switching (EAPS) network resiliency protocol

Extreme Networks® brings key technological innovations to the metro Ethernet market that can enable rich revenue-generating services with carrier-class scalability and availability.

The metro Ethernet market continues to grow, but increased competition and customer churn have metro service providers demanding solutions that increase revenue and lower operational costs. Designed from the ground-up for high service density, BlackDiamond 12800R series switches can enable metro service providers to increase revenue with more subscribers, and more services per subscriber.

BlackDiamond 12800R series allows a single Ethernet network to deliver both residential and business services. Residential services include triple play—where each subscriber can be directed to unique content providers for telephony services, IPTV, Internet access, and more. Business services include standard E-Line and E-LAN to connect multiple sites, plus tiered Internet access and VoIP to each business with hierarchical bandwidth and content re-direction controls.

New technology innovations built into BlackDiamond 12800R series switches make scaling and managing larger networks easy. Services are protected with carrier-class hardware, software, and network protection capabilities.

Target Applications

- Triple play of Internet access, IP Telephony, IP Television (IPTV), and more to residential subscribers
- Prioritized VPN, Internet access, Voice-over-IP (VoIP) and other applications over E-Line or multi-point E-LAN connections to business customers
- Aggregating residential triple play and business services on a common platform

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High Service Density

Rich bandwidth granularity and service prioritization of BlackDiamond 12800R series switches enable the triple play of voice, video and data, and more to each residential subscriber. The same Ethernet network delivers point-to-point (E-Line) and multi-point (E-LAN, VPLS) business services for site-site connectivity, tiered Internet access and prioritized Voice-over-IP to each enterprise customer.

Tiered Bandwidth Control

Hierarchical QoS

The H-QoS engine in BlackDiamond 12800R series allows bandwidth limits per service, per subscriber and per port. Thousands of subscribers with varying service requirements can share the same gigabit or 10 gigabit port, enabling scalable residential DSL and cable triple play; subscribers from each DSLAM or CMTS are aggregated into a shared connection to the BlackDiamond 12800R series switches for service control.

A business service example is prioritized E-Line with 2M for bronze, 10M for silver, 20M for gold customers. For each customer, the 2M, 10M or 20M can be further allocated based on their application priority. A single gigabit port can have thousands of gold, silver and bronze subscribers.

Ingress and Egress Control

BlackDiamond 12800R series switches support the H-QoS controls for ingress and egress, so bandwidth can be reserved *to* the subscriber for applications such as video on demand as well as *from* the subscriber for Peer-to-Peer applications. The controls also allow managing bandwidth to and from other application and bandwidth providers, extending both the network reach and unique services a metro provider can offer to its subscribers.

Granular Content Delivery

Service Multiplexing

BlackDiamond 12800R series enables multiple services to be multiplexed to each subscriber. DSL and cable subscribers aggregated into a common port can use different Internet Service Providers (ISPs) for Internet access—each subscriber can be routed on a unique vMAN to the respective ISP. Similarly, the video content from the metro provider can be distributed based on unique services purchased by a subscriber.

Traffic from each business customer can be classified by a combination of VLAN, vMAN, Port and Priority fields. This classification is used to map each business customer to unique vMAN and H-QoS settings that maintain the traffic prioritization of each customer over the metro network.

vMAN Cross-Connect

vMAN cross-connect allows bridging regional VLANs and vMANs to connect business sites. For a business that uses different VLANs or vMANs per site, the metro service provider can translate the customer tags between the sites, so the business can leave its internal infrastructure unchanged. This is useful in mergers and acquisitions and other activities that require convergence of multiple networks.

Advanced Services Engines

BlackDiamond 12800R series switches are designed from the ground-up to support new revenue-generating services.

CLEAR-Flow Security Engine

CLEAR-Flow is a fundamental new approach to detect and block security attacks at 10 gigabit speeds. With the monitoring and programming scale of Extreme Networks fourth generation ASICs, ExtremeXOS and memory architectures, CLEAR-Flow on BlackDiamond 12800R series examines each and every packet, at line-rate, and immediately acts upon rogue traffic, protecting each subscriber and their networks.

Business Services	Residential Services
☐ High-speed Internet access	☐ DSLAM and CMTS aggregation for residential triple play
☐ Voice-capable Ethernet-based Internet access services	☐ High-speed internet access
☐ Tiered Internet access services with rate limiting	☐ Bandwidth-based Internet access services
☐ E-Line services for point-to-point leased line replacement	☐ Local Voice
☐ E-LAN services for metro TLS replacing Frame Relay and ATM networks	☐ Long Distance Voice
	☐ HDTV
☐ VPN services over MLPS-based backbone	☐ Uni-cast video on demand
	☐ Network-hosted digital video recording
Single Physical Network Highly Available, Resilient, Scalable, Virtualized	

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Carrier-Class Scalability

Service providers now need solutions that allow them to support larger numbers of residential and business users spread over multiple sites and using a variety of applications, all on the same network. BlackDiamond 12800R series delivers new technology innovations to scale and manage large networks with ease.

Network Scaling

vMAN Scaling

By allowing overlapping VLANs in a network, vMANs enable metro providers to scale to a large number of customers. The vMAN technology alone, however, does not reduce the number of MAC addresses each switch must support. Further, even with vMAN, each traditional Ethernet switch can still only support 4,000 vMANs, a constraint as metro Ethernet networks scale to bigger deployments.

vMAN Peering

vMAN translation on Network-to-Network Interface (NNI) ports combined with H-QoS allows BlackDiamond 12800R series switches to peer with other network and application providers and extend network reach. Traffic to and from each peer can be controlled per vMAN and per class of service.

MAC-in-MAC

The MAC-in-MAC protocol, based on the IEEE 802.1ah standard, allows the metro provider to scale the network with Ethernet technology, maintaining management and operational simplicity and lower costs. MAC-in-MAC encapsulates vMAN traffic into an additional Ethernet header for routing within the core. Therefore, core Ethernet switches only need to learn the MAC addresses of edge switches that are directly connected to the core, and not the MAC addresses inside the customer VLANs. MAC-in-MAC also provides a higher number of vMAN instances for scaling to more subscribers.

MPLS Scaling

A metro provider can map each vMAN to a unique MPLS tunnel. By taking advantage of the Layer 2 traffic per customer and the hierarchical hub-and-spoke connectivity at the MPLS edge, H-VPLS provides a scalable approach to build an MPLS core.

Multicast Scaling

BlackDiamond 12800R series switches deliver multicast performance to thousands of concurrent multicast streams. The switch fabric uses multiple references to a packet's memory, avoiding multiple packet copies. This design allows efficient replication of multicast traffic for applications such as video distribution.

Service Provisioning

Policy Templates

The use of policy files on BlackDiamond 12800R switches allows simpler management of large numbers of subscribers and services.

Secured Access

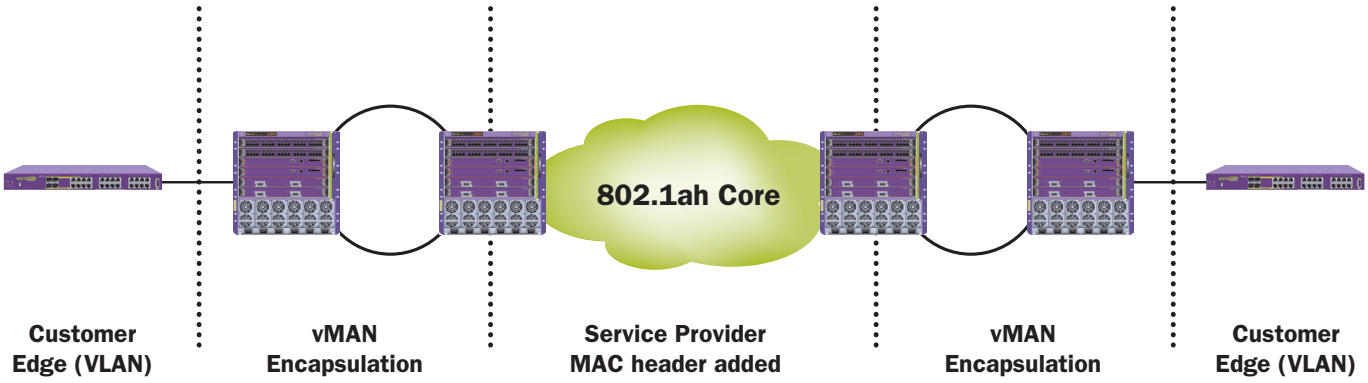
Beyond the flexible CLI support, protocols such as SSH2, SCP and SNMPv3 prevent the interception of management communications and man-in-the-middle attacks.

XML Interface

In addition to CLI and SNMP, BlackDiamond 12800R switches allow a metro provider to build a rich service-aware OSS by leveraging XML. The XML interface allows easier integration and scales to a large number of subscriber and service configurations.

Service Diagnostics

BlackDiamond 12800R series switches support a full range of fault-management capabilities to quickly detect service failure in large networks. Beyond standard Layer 3 features such as SNMP traps, IP ping and traceroute, the Layer 2 connectivity fault management tools with IEEE 802.1ag are also supported. These tools offer Layer 2 ping, traceroute, and continuity checks, so any link or switch failure can be quickly detected and corrected.



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Carrier-Class Availability

With increasing applications supported by a service provider, any network downtime means lost revenue and increased customer dissatisfaction. BlackDiamond 12800R switches offer comprehensive high availability with resilient hardware, modular software, and protection switching features, providing a high-quality customer experience.

Redundant Hardware Design

Advanced System Design

BlackDiamond 12800R series switches use a passive backplane complemented by high availability design elements such as isolated control and data planes, hardware-based traffic monitoring, redundant controller boards for power distribution, and redundant fan control and environmental monitoring to identify anomalies before they affect network availability. Resiliency is integral to each component including memory where ECC technology is used to automatically correct memory errors. Optimized multicast replication, large packet buffers for traffic bursts and large address tables for subscriber scale further maintain service availability and performance with a varying traffic mix.

Redundant Management Switch Modules

In the rare case of component failures, redundant Management Switch Module (MSM) blades on BlackDiamond 12804R switches provide high availability. The MSMs operate in a 1:1 (primary:standby) redundant configuration. If the primary MSM fails, the standby MSM assumes the primary role and supports the full load of all I/O modules. Redundant MSM is not applicable to the BlackDiamond 12802R switch.

Redundant Power Supplies

BlackDiamond 12800R series supports a set of redundant power configurations that can load share up to six internal power supplies simultaneously in BlackDiamond 12804R and up to four in BlackDiamond 12802R. These power supplies can be configured in an N + 1 configuration for power supply redundancy or N + N configuration to provide input power redundancy for a fully loaded chassis.

Modular ExtremeXOS Software

True Preemptive Multitasking and Protected Memory

BlackDiamond 12800R series allows each of the many tasks—such as Open Shortest Path First (OSPF) and Spanning Tree—to run as separate operating-system processes that are protected from each other as shown in Figure 1.

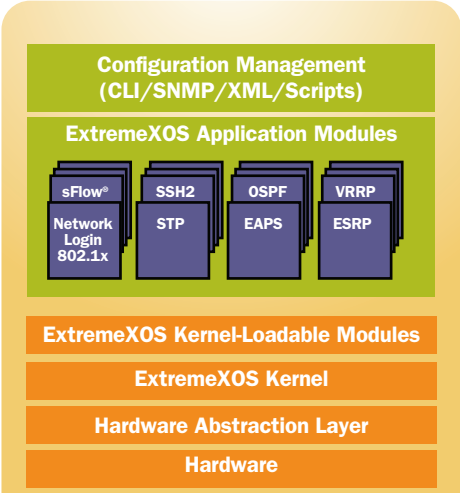

Figure 1: ExtremeXOS Modular Operating System

Process Monitoring and Restart

ExtremeXOS dramatically increases network availability by monitoring independent operating system processes in real time. If any of the processes become unresponsive, or stop running, they are automatically restarted.

Loadable Software Modules

The modular design of ExtremeXOS allows the extension of switch functionality. New functionality can easily be added to the switch.

Network Resiliency Protocols

Ethernet Automatic Protection Switching (EAPS)

EAPS allows the IP network to provide the level of resiliency and uptime that users expect from their traditional SONET networks. EAPS is superior to the Spanning Tree or Rapid Spanning Tree protocols, offering sub-second (less than 50 milliseconds) recovery.

Spanning Tree/Rapid Spanning Tree Protocols

BlackDiamond 12800R series switches support Spanning Tree, VLAN Spanning Tree, Rapid Spanning Tree (IEEE 802.1w), and Multiple Spanning Trees (IEEE 802.1s) protocols for Layer 2 resiliency.

Layer 3 Routing and Redundancy Protocols

BlackDiamond 12800R series switches support a comprehensive range of routing protocols including BGP and OSPF, with graceful restart extensions to avoid route flapping and improve network uptime. Redundancy protocols including VRRP and ESRP allow dynamic routing around individual switch or server downtime at Layer 2 or Layer 3.

Equal Cost Multipath

Equal Cost Multipath allows links to be load-balanced for performance and cost savings while also supporting redundant failover. If a link fails, traffic is automatically routed to the remaining links and connectivity is maintained.

Link Aggregation (802.3ad)

Cross-module link aggregation enables grouping of multiple links on a single logical connection (called a trunk). When one link in a trunk fails, traffic is routed to the remaining links in the trunk.

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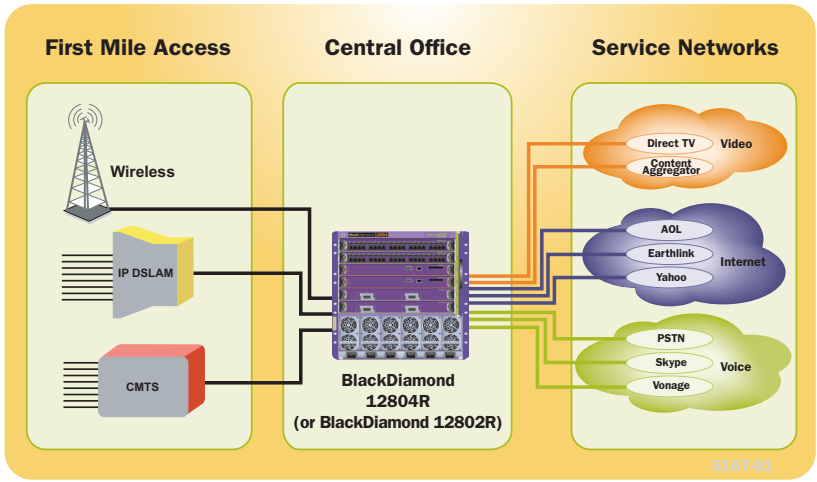
Target Applications

Residential Triple Play and More

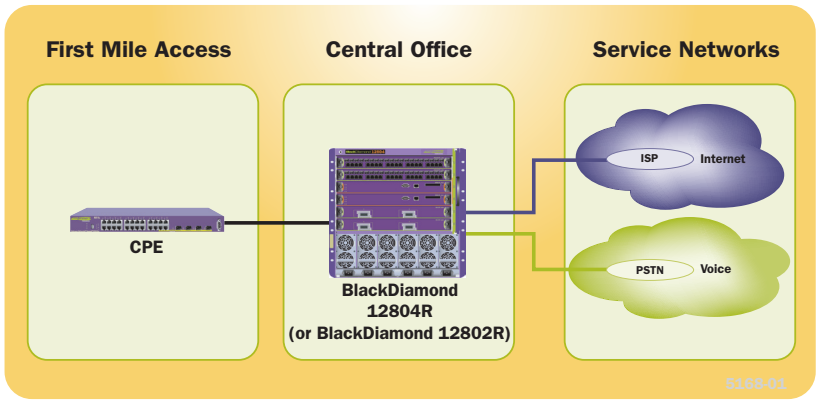
BlackDiamond 12800R series switches go beyond the delivery of the triple play of television, voice and high-speed Internet access to each home. Increased revenue opportunities are enabled with new services such as high definition television, interactive games, video on demand, network-hosted digital video recording and guaranteed-rate Internet access to the subscriber.

DSL, cable, and wireless subscribers terminate into a head-end device (DSLAM for DSL, CMTS for cable) which connects to a BlackDiamond 12800R switch for service delivery. The converged network eliminates the expense of building multiple overlay networks to provide these services.



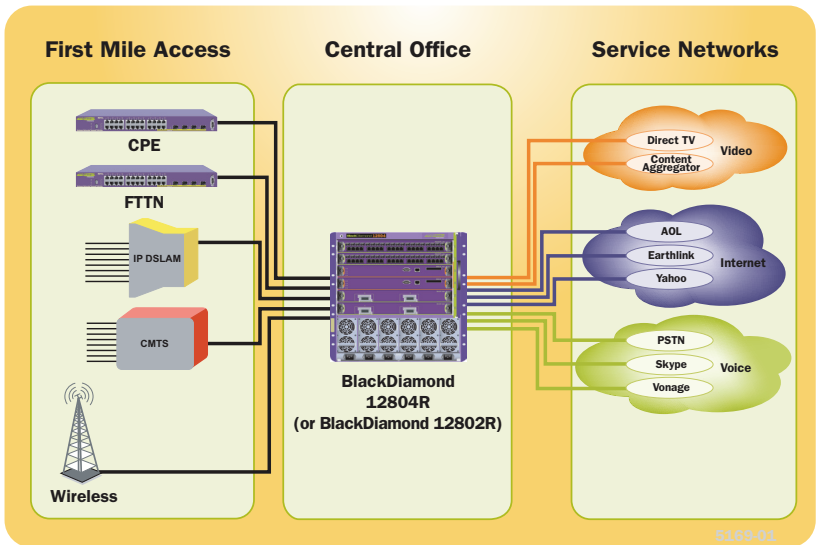
Business E-Line and E-LAN Services

Business point-to-point E-Line and multi-point E-LAN and VPLS services allow enterprises to connect multiple regional sites over a metro provider network. Each enterprise is typically assigned a unique port on an edge switch, which aggregates into a BlackDiamond 12800R series switch at gigabit or 10 gigabit speeds. With the convergence of voice and data networks in the enterprise, there is increasing demand for metro providers to offer additional services beyond site-to-site connectivity. BlackDiamond 12800R series switches enable this rich services mix, including unique Intranet, Internet and VoIP services, to each enterprise.



Single Platform for Residential and Business Service

Providing both residential triple play services and Metro Ethernet Forum (MEF) certified business services on a common platform allows a service provider to get the most out of their investment in Ethernet infrastructure. Small and medium sized businesses located near residential areas can now be brought onto the network in a cost-effective manner providing additional revenue streams for the service provider.



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Technical Specifications

ExtremeXOS 12.3 Supported Protocols

Switching

- RFC 3619 Ethernet Automatic Protection Switching (EAPS) and EAPSv2
- IEEE 802.1D – 1998 Spanning Tree Protocol (STP)
- IEEE 802.1D – 2004 Spanning Tree Protocol (STP and RSTP)
- IEEE 802.1w – 2001 Rapid Reconfiguration for STP, RSTP
- IEEE 802.1Q – 2003 (formerly IEEE 802.1s) Multiple Instances of STP, MSTP
- EMISTP, Extreme Multiple Instances of Spanning Tree Protocol
- PVST+, Per VLAN STP (802.1Q interoperable)
- Draft-ietf-bridge-rstpmib-03.txt – Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol
- Extreme Standby Router Protocol™ (ESRP)
- IEEE 802.1Q – 1998 Virtual Bridged Local Area Networks
- IEEE 802.3ad Static load sharing configuration and LACP based dynamic configuration
- Software Redundant Ports
- IEEE 802.1AB – LLDP Link Layer Discovery Protocol
- LLDP Media Endpoint Discovery (LLDP-MED), ANSI/TIA-1057, draft 08
- Extreme Discovery Protocol (EDP)
- Extreme Loop Recovery Protocol (ELRP)
- Extreme Link State Monitoring (ELSM)
- IEEE 802.1ag L2 Ping and traceroute, Connectivity Fault Management

Management and Traffic Analysis

- RFC 2030 SNTP, Simple Network Time Protocol v4
- RFC 854 Telnet client and server
- RFC 783 TFTP Protocol (revision 2)
- RFC 951, 1542 BootP
- RFC 2131 BOOTP/DHCP relay agent and DHCP server
- RFC 1591 DNS (client operation)
- RFC 1155 Structure of Mgmt Information (SMIv1)
- RFC 1157 SNMPv1
- RFC 1212, RFC 1213, RFC 1215 MIB-II, Ethernet-Like MIB & TRAPs
- RFC 1573 Evolution of Interface
- RFC 1650 Ethernet-Like MIB (update of RFC 1213 for SNMPv2)
- RFC 1901, 1905 – 1908 SNMP v2c, SMIv2 and Revised MIB-II
- RFC 2576 Coexistence between SNMP Version 1, Version 2 and Version 3
- RFC 2578 – 2580 SMIv2 (update to RFC 1902 – 1903)
- RFC 3410 – 3415 SNMPv3, user based security, encryption and authentication
- RFC 3826 – The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model
- RFC 1757 RMON 4 groups: Stats, History, Alarms and Events
- RFC 2021 RMON2 (probe configuration)
- RFC 2613 SMON MIB
- RFC 2925 Ping/Traceroute MIB
- RFC 2668 802.3 MAU MIB
- draft-ietf-hubmib-mau-mib-v3-02.txt
- RFC 1643 Ethernet MIB
- RFC 1493 Bridge MIB
- RFC 2096 IPv4 Forwarding Table MIB
- RFC 2737 Entity MIB v2
- RFC 2233 Interface MIB
- RFC 3621 PoE-MIB (PoE switches only)
- Secure Shell (SSH-2) client and server
- Secure Copy (SCP-2) client and server
- Secure FTP (SFTP) server
- sFlow® version 5
- Configuration logging
- Multiple Images, Multiple Configs
- RFC 3164 BSD Syslog Protocol with Multiple Syslog Servers
  - 999 Local Messages (criticals stored across reboots)
- Extreme Networks vendor MIBs (includes FDB, PoE, CPU, Memory MIBs)
- XML APIs over Telnet/SSH and HTTP/HTTPS
- Web-based device management interface – ExtremeXOS ScreenPlay™
- IP Route Compression

Security, Switch and Network Protection

- Secure Shell (SSH-2), Secure Copy (SCP-2) and SFTP client/server with encryption/authentication (requires export controlled encryption module)
- SNMPv3 user based security, with encryption/authentication (see above)
- RFC 1492 TACACS+
- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 3579 RADIUS EAP support for 802.1x
- RADIUS Per-command Authentication
- Access Profiles on All Routing Protocols
- Access Policies for Telnet/SSH-2/SCP-2
- Network Login – 802.1x, Web and MAC-based mechanisms
- IEEE 802.1x – 2001 Port-Based Network Access Control for Network Login
- Multiple supplicants with multiple VLANs for Network Login (all modes)
- Fallback to local authentication database (MAC and Web-based methods)
- Guest VLAN for 802.1x
- RFC 1866 HTML – Used for web-based Network Login and ScreenPlay
- SSL/TLS transport – used for web-based Network Login and ExtremeXOS ScreenPlay, (requires export controlled encryption module)
- MAC Security – Lockdown and Limit
- IP Security – RFC 3046 DHCP Option 82 with port and VLAN ID
- IP Security – Trusted DHCP Server
- Layer 2/3/4 Access Control Lists (ACLs)
- RFC 2267 Network Ingress Filtering
- RPF (Unicast Reverse Path Forwarding) Control via ACLs
- Wire-speed ACLs
- Rate Limiting / Shaping by ACLs
- IP Broadcast Forwarding Control
- ICMP and IP-Option Response Control
- SYN attack protection
- CPU DoS Protection with traffic rate-limiting to management CPU
- Robust against common Network Attacks:
  - CERT (http://www.cert.org)
  - CA-2003-04: "SQL Slammer"
  - CA-2002-36: "SSHredder"
  - CA-2002-03: SNMP vulnerabilities
  - CA-98-13: tcp-denial-of-service
  - CA-98.01: smurf
  - CA-97.28:Teardrop_Land -Teardrop and "LAND" attack
  - CA-96.26: ping
  - CA-96.21: tcp_syn_flooding
  - CA-96.01: UDP_service_denial
  - CA-95.01: IP_Spoofing_Attacks_and_Hijacked_Terminal_Connections
  - IP Options Attack
- Host Attacks
  - Teardrop, boink, opentear, jolt2, newtear, nestea, syndrop, smurf, fraggle, papasmurf, synk4, raped, winfreeze, ping –f, ping of death, pepsi5, Latierra, Winnuke, Simping, Sping, Ascend, Stream, Land, Octopus

Security, Router Protection – Requires Edge License or above

- IP Security – DHCP enforcement via Disable ARP Learning
- IP Security – Gratuitous ARP Protection
- IP Security – DHCP Secured ARP/ARP Validation
- Routing protocol MD5 authentication (see above)

Security Detection and Protection in Core and Aggregation Products

- CLEAR-Flow, threshold-based alerts and actions *(BlackDiamond 20808, BlackDiamond 12800, BlackDiamond 10808, BlackDiamond 8800 c-series modules, BlackDiamond 8900-series modules, Summit® X650 series and Summit X450a series in non-SummitStack™ configuration only)*

IPv4 Host Requirements

- RFC 1122 Host Requirements
- RFC 768 UDP
- RFC 791 IP
- RFC 792 ICMP
- RFC 793 TCP
- RFC 826 ARP
- RFC 894 IP over Ethernet
- RFC 1027 Proxy ARP
- RFC 2068 HTTP server
- IGMP v1/v2/v3 Snooping with Configurable Router Registration Forwarding
- IGMP Filters
- PIM Snooping
- Static IGMP Membership
- Multicast VLAN Registration (MVR)

IPv4 Router Requirements – Requires Layer 3 Edge License or above

- RFC 1812 Requirements for IP Version 4 Routers
- RFC 1519 CIDR
- RFC 1256 IPv4 ICMP Router Discovery (IRDP)
- Static Unicast Routes
- Static Multicast Routes
- RFC 1058 RIP v1
- RFC 2453 RIP v2
- Static ECMP
- RFC 1112 IGMP v1
- RFC 2236 IGMP v2
- RFC 3376 IGMP v3
- RFC 2933 IGMP MIB
- RFC 2096 IPv4 Forwarding Table MIB
- RFC 1724 RIPv2 MIB

IPv4 Router Requirements – Requires Advanced Edge License or above

- RFC 2338 VRRP
- RFC 2787 VRRP MIB
- RFC 2328 OSPF v2 (Edge-mode)
- OSPF ECMP
- OSPF MD5 Authentication
- RFC 1587 OSPF NSSA Option
- RFC 1765 OSPF Database Overflow
- RFC 2370 OSPF Opaque LSA Option
- RFC 3623 OSPF Graceful Restart
- RFC 1850 OSPFv2 MIB
- RFC 2362 PIM-SM (Edge-mode)
- RFC 2934 PIM MIB
- RFC 3569, draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
- draft-ietf-pim-mib-v2-01.txt

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Technical Specifications

IPv6 Host Requirements
- RFC 2460, Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461, Neighbor Discovery for IP Version 6, (IPv6)
- RFC 2463, Internet Control Message Protocol (ICMPv6) for the IPv6 Specification
- RFC 2464, Transmission of IPv6 Packets over Ethernet Networks
- RFC 2465, IPv6 MIB, General Group and Textual Conventions
- RFC 2466, MIB for ICMPv6
- RFC 2462, IPv6 Stateless Address Auto configuration – Host Requirements
- RFC 1981, Path MTU Discovery for IPv6, August 1996 – Host requirements
- RFC 3513, Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3587, Global Unicast Address Format
- Telnet server over IPv6 transport
- SSH-2 server over IPv6 transport
- Ping over IPv6 transport
- Traceroute over IPv6 transport

IPv6 Interworking and Migration
- RFC 2893, Configured Tunnels
- RFC 3056, 6to4

IPv6 Router Requirements – Requires Edge License or above
- RFC 2462, IPv6 Stateless Address Auto configuration – Router Requirements
- RFC 1981, Path MTU Discovery for IPv6, August 1996 – Router requirements
- RFC 2710, IPv6 Multicast Listener Discovery v1 (MLDv1) Protocol
- RFC 3810, IPv6 Multicast Listener Discovery v2 (MLDv2) Protocol
- Static Unicast routes for IPv6
- RFC 2080, RIPng
- Static ECMP

Core Protocols for Layer 2, IPv4 and IPv6 – Requires Core License or above
- EAPSv2 Shared Ports – multiple interconnections between rings
- PIM-DM Draft IETF PIM Dense Mode draft-ietf-idmr-pim-dm-05.txt, draft-ietf-pim-dm-new-v2-04.txt
- RFC 3618 Multicast Source Discovery Protocol (MSDP)
- RFC 3446 Anycast RP using PIM and MSDP
- RFC 2740 OSPFv3, OSPF for IPv6
- RFC 1771 Border Gateway Protocol 4
- RFC 1965 Autonomous System Confederations for BGP
- RFC 2796 BGP Route Reflection (supersedes RFC 1966)
- RFC 1997 BGP Communities Attribute
- RFC 1745 BGP4/IDRP for IP-OSPF Interaction
- RFC 2385 TCP MD5 Authentication for BGPv4
- RFC 2439 BGP Route Flap Damping
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 4360 BGP Extended Communities Attribute
- RFC 4486 Subcodes for BGP Cease Notification message
- draft-ietf-idr-restart-10.txt Graceful Restart Mechanism for BGP
- RFC 4760 Multiprotocol extensions for BGP-4
- RFC 1657 BGP-4 MIB
- Draft-ietf-idr-bgp4-mibv2-02.txt – Enhanced BGP-4 MIB
- RFC 1195 Use of OSI IS-IS for Routing in TCP/IP and Dual Environments (TCP/IP transport only)
- RFC 2763 Dynamic Hostname Exchange Mechanism for IS-IS
- RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
- RFC 2973 IS-IS Mesh Groups
- RFC3373 Three-way Handshake for IS-IS Point-to-Point Adjacencies
- RFC 3784 IS-IS Externs for Traffic Engineering (wide metrics only)
- Draft-ietf-isis-restart-02 Restart Signaling for IS-IS
- Draft-ietf-isis-ipv6-06 Routing IPv6 with IS-IS
- Draft-ietf-isis-wg-multi-topology-11 Multi Topology (MT) Routing in IS-IS

QoS and VLAN Services
Quality of Service and Policies
- IEEE 802.1D – 1998 (802.1p) Packet Priority
- RFC 2474 DiffServ Precedence, including 8 queues/port
- RFC 2598 DiffServ Expedited Forwarding (EF)
- RFC 2597 DiffServ Assured Forwarding (AF)
- RFC 2475 DiffServ Core and Edge Router Functions

VLAN Services: VLANs, vMANs
- IEEE 802.1Q VLAN Tagging
- IEEE 802.1v: VLAN classification by Protocol and Port
- Port-based VLANs
- Protocol-based VLANs
- MAC-based VLANs
- Multiple STP domains per VLAN
- Upstream Forwarding Only / Disable Flooding
- draft-sanjib-private-vlan-09.txt Private VLANs
- VLAN Translation
- IEEE 802.1ad Provider Bridge Network, virtual MANs (vMANs)
- vMAN Ethertype Translation/Secondary vMAN Ethertype
- Multicast Support for PVLAN
- Multicast Support for VLAN Aggregation
- VLAN Aggregation (not applicable to Summit X150 and Summit X350)

Advanced VLAN Services, MAC-in-MAC, PBB-TE—Requires Advanced Edge License or above (BlackDiamond 10808 and BlackDiamond 12800 series only)
- VLAN Translation in vMAN environments
- vMAN Translation
- IEEE 802.1ah/D1.2 Provider Backbone Bridges (PBB)/MAC-in-MAC
- IEEE 802.1Qay Provider Backbone Transfer (PBB-TE/PBT)

MPLS and VPN Services
Multi-Protocol Label Switching (MPLS): Requires MPLS Layer 2 Feature Pack License (BlackDiamond 10808, BlackDiamond 12800R and BlackDiamond 20800 series only)
- RFC 2961 RSVP Refresh Overhead Reduction Extensions
- RFC 3031 Multiprotocol Label Switching Architecture
- RFC 3032 MPLS Label Stack Encoding
- RFC 3036 Label Distribution Protocol (LDP)
- RFC 3209 RSVP-TE: Extensions to RSVP for LSP Tunnels
- RFC 3630 Traffic Engineering Extensions to OSPFv2
- RFC 3784 IS-IS extensions for traffic engineering (wide metrics only)
- RFC 3811 Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management
- RFC 3812 Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)
- RFC 3813 Multiprotocol Label Switching (MPLS) Label Switching Router (LSR) Management Information Base (MIB)
- RFC 3815 Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)
- RFC 4090 Fast Re-route Extensions to RSVP-TE for LSP (Detour Paths)
- RFC 4379 Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures (LSP Ping)

Layer 2 VPNs—Requires MPLS Layer 2 Feature Pack License (BlackDiamond 10808, BlackDiamond 12800R and BlackDiamond 20808 series only)
- RFC 4447 Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)
- RFC 4448 Encapsulation Methods for Transport of Ethernet over MPLS Networks
- RFC 4762 Virtual Private LAN Services (VPLS) using Label Distribution Protocol (LDP) Signaling
- RFC 5085 Pseudowire Virtual Circuit Connectivity Verification (VCCV)

BlackDiamond 12804R

General Specifications

Switching Capacity
- BlackDiamond 12804R: 160 Gbps total switching capacity, with 9 microsecond latency for 64-byte packets

MSM and I/O Modules
- MSM-5R: MSM-5R module contains both the control plane as well as the switch fabric
- MSM-6R: MSM-6R module contains both the control plane as well as the switch fabric
- GM-20XTR: 20-port Gigabit Ethernet module
- Each port can be used for10/100/1000BASE-T or SFP connectivity (requires SFP modules)
- XM-2XR: 2-port 10G module. XENPAK modules required
- XM-2HR: 1-port 10G and 10-port Gigabit Ethernet hybrid module. XENPAK modules required

Power Supply Options
Both AC and DC power supplies are available
- BlackDiamond 12804: AC power supplies can run from 90 – 264 VAC, and deliver
  - 700W at 90V to 120V, or
  - 1200W at 200V to 240V
- BlackDiamond 12804: 48V DC power supplies deliver 1200W of power

Physical Specifications

Dimensions
- BlackDiamond 12804: Chassis: 17.5” high x 17.51” wide x 18.23” deep (44.45 cm x 44.5 cm x 46.3 cm)
- MSM Module Dimensions: 1.63” high x 15.26” wide x 15.25” deep (4.1 cm x 38.8 cm x 38.7 cm)
- I/O Module Dimensions: 1.63” high x 15.26” wide 15.25” deep (4.1 cm x 38.8 cm x 38.7 cm)

Weight
- BlackDiamond 12804 Empty Chassis: 65 lb (29.5 kg)
- BlackDiamond 12804 Power Supply: 7 lb (3.2 kg)
- MSM-5R 8.75 lb (4.0 kg)
- MSM-6R 9 lb (4.1 kg)
- G20XTR 8.5 lb (3.9 kg)
- XM-2XR 7.25 lb (3.3 kg)
- XM-2HR 7.5 lb (3.4 kg)

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Technical Specifications

Power
- BlackDiamond 12804 Chassis with Fan Trays: 45W, 48V, 1.0A (Heat Dissipation: 154 BTU)
- MSM-5R: BlackDiamond 12804: 200W, 48V, 4.3A (Heat Dissipation: 683 BTU)
- MSM-6R: BlackDiamond 12804: 206W, 48V, 4.3A (Heat Dissipation: 703 BTU)
- GM-20XTR Module: 169W, 48V, 3.5A (Heat Dissipation: 577 BTU)
- XM-2XR Module: 150W, 48V, 3.1A (Heat Dissipation: 512 BTU)
- XM-2HR Module: 200W, 48V, 2.9A (Heat Dissipation: 481 BTU)

BlackDiamond 12802R

General Specifications

Switching Capacity
- BlackDiamond: 12802R 80Gbps total switching capacity with 9microsecond latency for 64-byte packets
- MSM and I/O Modules
- MSM-5R: MSM-5R module contains both the control plane as well as the switch fabric
- MSM-6R: MSM-6R module contains both the control plane as well as the switch fabric
- GM-20XTR: 20-port Gigabit Ethernet module
- Each port can be used for 10/100/1000BASET or SFP connectivity (requires SFP modules)
- XM-2XR: 2-port 10/G module. XENPAK modules required
- XM-2HR: 1-port 10G and 10-port Gigabit Ethernet hybrid module. XENPAK modules required

Power Supply Options
- Both AC and DC power supplies are available
- BlackDiamond 12802: AC power supplies can run from 90-264 VAC, and deliver 325W
- BlackDiamond 12802: 48V DC power supplies deliver 325W

Physical Specifications

Dimensions
- BlackDiamond 12802 Chassis: 5.25” high x 17.25” wide x 21.25” deep
- MSM Module Dimensions: 1.63” high x 15.26” wide x 15.25” deep (4.1 cm x 38.8 cm x 38.7 cm)
- I/O Module Dimensions: 1.63” high x 15.26” wide x 15.25” deep (4.1 cm x 38.8 cm x 38.7 cm)

Weight
- BlackDiamond 12802 Empty Chassis: 29.25 lb (13.3kg)
- BlackDiamond 12802 Power Supply: 2.25 lb (1 kg)
- MSM-5R 8.75 lb (4.0 kg)
- MSM-6R 9 lb (4.1 kg)
- G20XTR 8.5 lb (3.9 kg)
- XM-2XR 7.25 lb (3.3 kg)
- XM-2HR 7.5 lb (3.4 kg)

Power
- BlackDiamond 12802 Chassis with Fan Trays: 26W (Heat Dissipation: 89 BTU)
- MSM-5R: BlackDiamond 12802: 170W, 48V, 3.5A (Heat Dissipation: 580 BTU)
- MSM-6R: BlackDiamond 12804: 175W, 48V, 3.6A (Heat Dissipation: 597 BTU)
- BlackDiamond 12802: 170W, 48V, 3.5A (Heat Dissipation: 580 BTU)
- GM-20XTR Module: 169W, 48V, 3.5A (Heat Dissipation: 577 BTU)
- XM-2XR Module: 150W, 48V, 3.1A (Heat Dissipation: 512 BTU)
- XM-2HR Module: 141W, 48V, 2.9A (Heat Dissipation: 481 BTU)

BlackDiamond 12804R and BlackDiamond 12802R

Operating Specifications

- Operating Temperature Range 0° C to 40° C (32° F to 104° F)
- Operating Humidity: 10% to 95% relative humidity, non-condensing
- Transportation Temperature: -40° C to 70° C (-40° F to 158° F)
- Storage and Transportation Humidity: 10% to 95% relative humidity, non-condensing

Regulatory/Safety Standards

North American Safety of ITE
- UL 60950-1:2003 1st Ed., Listed Device (U.S.)
- CSA 22.2#60950-1-03 1st Ed.(Canada)
- Complies with FCC 21CFR Chapter1, Subchapter J (U.S. Laser Safety)
- CDRH Letter of Approval (U.S. FDA Approval)
- IEEE 802.3af 6-2003 Environment A for PoE Applications

European Safety of ITE
- 73/23/EEC Low Voltage Directive
- EN 60950-1:2001
- EN 60825-1+A2:2001 (Lasers Safety)
- TUV-R GS Mark

International Safety of ITE
- CB Report & Certificate per IEC 60950-1:2001+All National Difference

EMI/EMC Standards

North America EMC for ITE
- 89/336/EEC EMC Directive
- FCC CFR 47 part 15 Class A (USA)
- CES-003 Class A (Canada)
- European EMC standards
- EN 55022:2006 Class A
- EN 55024:2006
  - includes IEC 61000-4-2, 3, 4, 5, 6, 8, 11
- EN 61000-3-2 v2.1 2001-10 (Harmonics)
- EN 61000-3-3 v1.1 2002-03 (Flicker)
- ETSI EN 300 386 : v1.3.3, 2005-04 (EMC Telecommunications)

International EMC Certifications
- CISPR 22: 2006 Class A (International Emissions)
- CISPR 24 A2:2002 (International Immunity)
- IEC/EN 61000-4-2 Electrostatic Discharge, 8kV Contact, 15kV Air, Criteria A
- IEC/EN 61000-4-3 Radiated Immunity 10V/m, Criteria A
- IEC/EN 61000-4-4 Transient Burst, 1kV, Criteria A
- IEC/EN 61000-4-5 Surge, 2kV, 4kV, Criteria A
- IEC/EN 61000-4-6 Conducted Immunity, 0.15-80MHz, 10V/m mod. RMS, Criteria A
- IEC/EN 61000-4-11 Power Dips & Interruptions, >30%, 25 periods, Criteria C

Country Specific
- VCCI Class A (Japan Emissions)
- ACA (Australia Emissions & Safety)
- CNS 13438:1997 Class A (BSMI-Taiwan)
- ANATEL, Resolution 237, 238 & 242 (Brazil) In process
- NOM/NYCE (Mexico)
- MIC Mark, KN-22, KN-24, EMC Approval (Korea)

Environmental

- EN/ETSI 300 019-2-1 v2.1.2 – Class 1.2 Storage
- EN/ETSI 300 019-2-2 v2.1.2 – Class 2.3 Transportation
- EN/ETSI 300 019-2-3 v2.1.2 – Class 3.1e Operational
- EN/ETSI 300 753 (1997-10) – Acoustic Noise
- NEBS GR-63 Issue 2 – Sound Pressure 1.5G
- ASTM D3580 Random Vibration Unpackaged 1.5G

Warranty

- Ltd. 1-year on Hardware
- 90-days on Software

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Ordering Information

BlackDiamond 12800R

Part Number	Name	Description
65040	BlackDiamond 12804 6-slot Chassis	BlackDiamond 12804 6-slot Chassis (includes fan tray and blank front panels)
60020	BlackDiamond 700W/1200W PSU	BlackDiamond 700W/1200W 100-240V AC PSU
60021	BlackDiamond 1200W -48V DC PSU	BlackDiamond 1200W -48V DC PSU
65020	BlackDiamond 12802 3-slot Chassis	BlackDiamond 12802 3-slot Chassis
65021	BlackDiamond 325W AC PSU	BlackDiamond 12802 325W 100 240V AC PSU
65022	BlackDiamond 325W 48V DC PSU	BlackDiamond 12802 325W 48V DC PSU
65025	BlackDiamond 12802 DC PSU Cable	BlackDiamond 12802 DC Power Supply Cable Kit
65011	BlackDiamond 12800 MSM-5R	BlackDiamond 12800 Management Switch Module w/Rate Limiting
65013	BlackDiamond 12800 MSM-6R	BlackDiamond 12800 Management Switch Module-6R w/Rate Limiting
66041	BlackDiamond 12800 XM-2HR	BlackDiamond 12800 1-port 10G XENPAK and 10 port 1000BASE-X SFP/1000T Hybrid Module with Rate Limiting
66051	BlackDiamond 12800 XM-2XR	BlackDiamond 12800 2-port 10G XENPAK Module with Rate Limiting
67010	BlackDiamond 12800 MPLS Feature Pack	BlackDiamond 12800 ExtremeXOS MPLS Feature Pack
67011	BlackDiamond 12800 HQoS Feature Pack	BlackDiamond 12800 HQoS Feature Pack
67012	BlackDiamond 12802 Core License	BlackDiamond 12802 Core License
41112	BlackDiamond 8800/BlackDiamond 12800 Spare PSU/Fan Controller	BlackDiamond 8800/BlackDiamond 12800 Spare PSU/Fan Controller board
41121	BlackDiamond 8800/BlackDiamond 12800 Spare Blank Panel	BlackDiamond 8800/BlackDiamond 12800 Spare Blank Panel
41151	BlackDiamond 8800/BlackDiamond 12800 Cable Management Clip Kit	BlackDiamond 8800/BlackDiamond 12800 Cable Management Clip Kit
65043	BlackDiamond 8806/BlackDiamond 12804 Spare Fan Tray	BlackDiamond 8806/BlackDiamond 12804 Spare Fan Tray
65046	BlackDiamond 8806/BlackDiamond 12804 Mid Mount Kit	BlackDiamond 8806/BlackDiamond 12804 Mid Mount Kit
65023	BlackDiamond 12802 Spare Fan Tray	BlackDiamond 12802 Spare Fan Tray
65024	BlackDiamond 12802 Spare PSU/Fan Controller	BlackDiamond 12802 Spare PSU/Fan Controller
65026	BlackDiamond 12802 Mid Mount Kit	BlackDiamond 12802 Mid Mount Kit
10110	SR XENPAK	10 Gigabit Ethernet XENPAK Transceiver, 850nm, up to 300m on multimode fiber, SC connector
10111	LR XENPAK	10 Gigabit Ethernet XENPAK Transceiver, 1310nm, up to 10km on single-mode fiber, SC connector
10112	ER XENPAK	10 Gigabit Ethernet XENPAK Transceiver, 1550nm, up to 40km on single-mode fiber, SC connector
10113	ZR XENPAK	10 Gigabit Ethernet XENPAK Transceiver, 1550nm, up to 80km on single-mode fiber, SC connector
10114	LX4 XENPAK	10 Gigabit Ethernet WWDM XENPAK Transceiver, 1310nm, up to 300m on multimode fiber and up to 10km on single mode fiber, SC connector
10051	SX SFP	SFP, 1000BASE-SX, LC connector
10052	LX SFP	SFP, 1000BASE-LX, LC connector
10053	ZX SFP	SFP, Extra long distance SMF 70 Km/21 dB budget, LC connector

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